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ABSTRACT

The use of programmed learning in 4-H nutrition projects is discussed as to objectives and learning principles. Three games designed for use with 9- and 10-year-old 4-H members are described and illustrated. The procedure for testing the games and an evaluation of the test results are presented. Conclusions and recommendations are given. (DB)

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PROGRAMMED LEARNING GAMES

applied to the

4-H Food - Nutrition Project

Paper adapted from Seminar Paper, "Programmed Learning - an Educational Tool for 4-H" by Carol Watkins, Candidate for M. S., University of Maryland

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CONTENTS

I. Introduction

A. Educational Games Emerge as a Method of Teaching

B. Designing Educational Games

C. Implications of the Game Theory to 4-H

II. Experimental Games to Teach Nutrition

A. Objectives and Goals Defined

B. Learning Principles Considered

C. Nutrition Games

D. Procedure of Testing

E. Evaluation

F. Observation and Results

III. Conclusion

PROGRAMMED LEARNING GAMES APPLIED TO THE 4-H FOOD - NUTRITION PROJECT

I. INTRODUCTION

Educational Games Emerge as a Method of Teaching

Educational games can be wonderful fun for youth, and they are opportunities for teachers to identify and encourage divergent, creative thinking and problem-solving. Such an instructional program provides a basis for close interaction and active responding between the learner and the subject matter. Many of the simulated games being designed provide opportunities for learning about some of the complex systems of society. Monopoly was the forerunner of these games dealing with economics.

In 1928, Dewey advocated games as an integral part of the school curriculum. Games provide opportunities for youth to experiment and learn in the relative "safe" world of make believe. There is also much to be said for the benefits derived from the interactions of the players. Not all children learn equally well from the same experience, but even players not challenged by a particular game are drawn into learning situations by the actions of the other players. Thus, players not only learn by interacting; they also may learn to interact!

Research work with several games since 1963 has lead to the hypothesis that games do teach and the players learn from participation in them. The clearest advantage of games seems to be students' increased motivation and interest, thus focusing attention on the facts to be learned. As a different method of teaching, games can extend youth's thinking to different ways of relating tc a subject and to what they already know -- to new problems and new solutions. They help some children to break through the barrier of rigid question and answer thinking. A general consensus from research would seem to indicate that games can and do have a carry-over potential and that makes subsequent conventional instruction more effective.

Another real contribution which games can make is narrowing the gap between slow and rapid learners. Individuals are able to share interactions while learning at different levels as they participate in a game situation. Any teaching tool which allows the high and low achievers to work together and help learn from each other deserves serious attention from education.

Designing Educational Games

The designing of effective games for learning requires first of all the consideration and use of basic steps used in other methods of programmed instruction: (1) analysis of the subject to be programmed, (2) identifying definite objectives and goals so that (3) small sequentially ordered steps for reaching them can be determined, and (4) determination of the best format for producing the maximum participation and learning. The format decided upon should be one that encourages much activity.

The intentionally educational game should include a combination of the science and the drama of the subject-matter being programmed. The subject-matter should be approached from the student's viewpoint in that the best stimulus for learning comes from the student's intrinsic interest in the subject-matter. For greatest interest on the part of youth, games should also be entertaining. However, the entertainment must be relevant to the players' life experiences and the language used suitable to the age level.

Games need to be constructed so that the skill, insight or facts to be learned are clearly needed to succeed in the game. These must also be planned in accordance with the particular age group for which the game is designed.

Implications for the Game Theory in 4-H

Because of the nature of 4-H, the game method of programmed learning ought to be readily assimilated into 4-H project activities. The game idea is compatible to the active "learning by doing" concept upon which 4-H was founded. In recent years, 4-H has concerned itself with more technical aspects of the game theory by participating in the development and testing of several nationally-distributed simulated games, designed to teach concepts of "Emergency Preparedness," "Democracy," "Legislation," and "Life Careers."

The real potential for the game theory of programmed learning in 4-H could be coordinating the more technical subject-matter in the project with the actual doing activities as they are outlined in 4-H project manuals.

II. EXPERIMENTAL GAMES - TO TEACH NUTRITION

Objectives and Goals Defined

Nutrition and the 4-H Foods - Nutrition project would appear to be an excellent choice for attempting to design auto-instructional games for 4-H. All the activities of this project, except the nutrition, quite naturally become a part of the active doing of the food preparation. The nutrition, while very much related, is somewhat different - more abstract. The game method of programmed learning could prove successful in eliminating the "have-to" stigma or connotation that often prevents nutrition from being included as an active fun part of the project or special interest meetings.

Much of the actual work with beginning 4-H'ers is done by volunteer leaders or junior and teen leaders. So the more immediate or realistic objective is to:

> Explore methods of increasing the leaders' ability to identify nutritional principles, and
>
> Provide guidelines and tools to help them teach the basic principles to beginning members.

The goals for members must also be included if a game is to be designed for their use. So, the "4-4-3-2 for a Healthier, Happier You" theme from the 4-H Food - Nutrition manual may be used to help identify specific goals to use in preparing programmed games that would:

> Increase the nutritional learning experiences available for 4-H'ers by providing a new or different way for them to --
>
> A. Recognize each of the four food groups necessary for maintaining health.
>
> B. Be able to identify the amount of each food group needed to meet the minimum daily requirements of an adequate diet.
>
> And the companion goal --
>
> C. Stimulate the thinking of leaders about nutrition and ways of teaching it to younger members.

Martin lists several important elements in a childs learning that applies to nutrition education - his goals, his motives, readiness to learn and emotional climate of the learning situation. She says the extent to which such factors contribute to learning depends on how well they are recognized and utilized. With this in mind several learning theorists and theories were incorporated into the designing of three games to meet the stated goals and objectives.

Learning Principles Considered

1. The learner should be an active participant in his learning.

   The Functionalists emphasis on action, learning by doing, is pertinent here since it relates directly to the 4-H philosophy. S-R theorists all emphasize the importance of responses. But game responses would seem to require responses more nearly like those of Skinner or Hull rather than Gutherie where the movement alone is the response learned.

2. Game must be GOAL ORIENTED to provide insight into nutrition Concept.

   If not goal oriented all that will be learned will be the mechanics of the game. Goal orientation requires well defined objectives - good organization - good gestalt. Tolman's place learning.

3. The learner needs opportunities to form RELATIONSHIPS.

   Need to be able to relate foods, kinds and amounts to the body's well being. Presenting concepts together will enable them to be perceived as belonging together. Gestaltists Law of Pragnez, similarity and proximity; also Skinners shaping, and Gutheries recency.

4. Provide different ways of thinking about or looking at a subject.

   Gutheries deliberate variation of stimulus. Doing rather than just reading. (K) incentive.

5. Repetition - Law of Exercise (Thorndike). Frequency of repetition permits repeated reinforcement that strengthens habits.

   Understanding, knowledge, and abiiity to play the game become secondary reinforcement in process. Gestalt theory says repetitions are successive exposures that bring about new insights or relationships and consolidation of trace systems in the cognitive map.

6. Reinforcement - Effect. Playing the game should be its own reward.

   The novelty effect, the doing and immediate response to activity should provide satisfaction.

7. Begin with what the learner already knows - where the member is.

   Take cues from players actions, build and shape the learning desired from their reactions and responses to the game.

8. Use small easy steps that can be completed in a short time - within the interest span and maturity level of the 9 and 10 year old.

Nutrition Games

There are many possibilities for designing games to help members identify and relate foods to nutrition and health. To keep the problem of game mechanics at a minimum it was decided for this experiment, to use objects or games already familiar to the ages (nine and ten) being programmed for playing the game. In exploring possibilities, everything from nonsense rhynes to the "20 question" type format was considered.

Three games were designed each using a different format. It was hoped the experimental games might stimulate thinking about, or creation of other games using similar objects. The idea was to use first - a game or object from the childs toy box; second - objects or supplies readily available in the home, preferably the kitchen; and third - cards of some type.

Game I. Nutrition from the Toy Box:

The toys: 'Kooky Zoo' plastic parts for building animals and 'Dice'.

The object of the game: to build an animal from the four food groups. The 'Kooky Zoo' plastic parts were divided into four groups to represent the foods. In giving instructions for the game, each group was associated with specific nutrients and parts of the body. Players were also told that since all foods contribute to all parts of the body they were free to interchange parts. They could combine individual pieces in any way they wished to build their animal, but, they had to roll the correct number on the dice to get the part to build with. Rules for building are:

1.

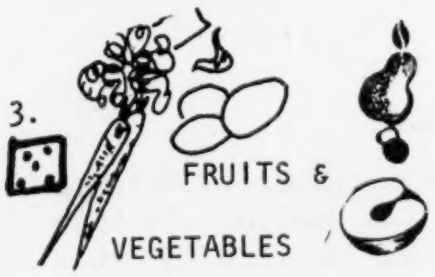
MEAT GROUP

Start with the body.
You need PROTEIN to build the best body.
Protein comes from the MEAT GROUP.
At least TWO servings of Meat or other Protein is required daily.....so
Roll a 2 on dice to BUILD HEALTHY BODIES.

2.

MILK GROUP

The MILK GROUP provides CALCIUM for strong BONES. Nine and ten year olds need three servings a day. Roll 3's to get more MILK in your diet and arms and legs for body.

3. 

FRUITS & VEGETABLES

FRUITS AND VEGETABLES give us VITAMINS and MINERALS - the connecting links that keep things going add vitality. Need 4 or more servings a day from this group so get a FIVE (5) with the dice to make the right kind of connections.

4.

BREADS & CEREALS

The BREADS AND CEREALS are also important for Vitamins and Minerals but, they also add extra calories, so for added energy and all the extras for your animal (tail, ears) will come from roiling 4's for the FOUR servings a day you need of Breads & Cereals.

Game II. Nutrition Fun With Kitchen Equipment:

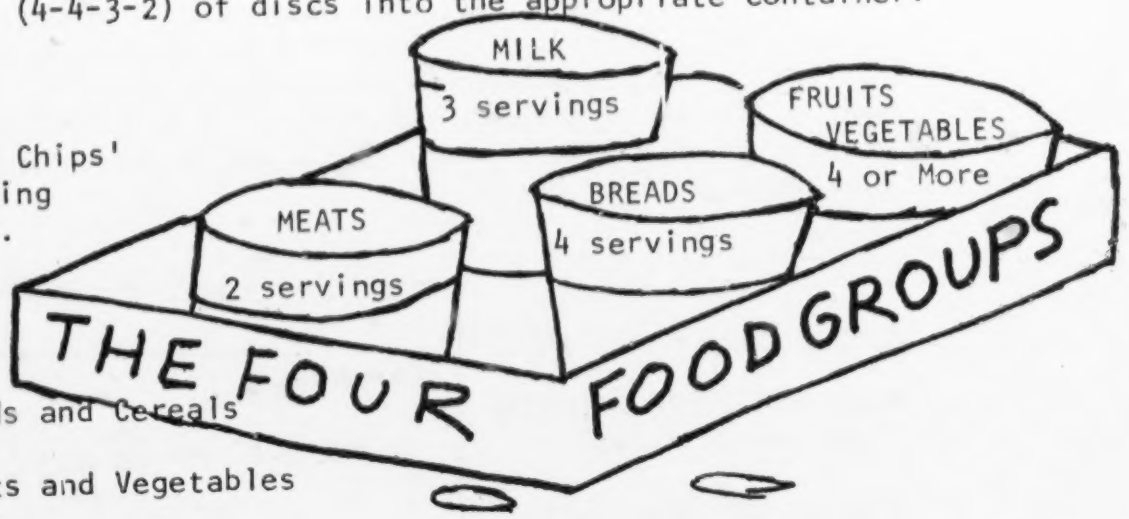
This was the simplest of the games designed. Nutritional concepts programmed were kept to the Four Food Groups and the number of servings of each. Instructions given the players were deliberately kept at a minimum and brief.

The equipment used: FOUR CONTAINERS - (juice cans, cottage cheese or milk cartons, cups, etc.). Each should be labeled with the name and/or pictures of one of the food groups and the number of servings of that food group needed to meet the daily food requirements. Each container was further identified by being color keyed to the USDA Four Food charts. The containers were placed inside A LARGE SHALLOW BOX or (cake pay or food tray) labeled The Four Food Groups. Its purpose was to help catch the mis-thrown 'Discs', (beans, button, or similar objects).

Object of the game: To recognize the four food groups and be able to identify the number of recommended servings by getting the correct number (4-4-3-2) of discs into the appropriate container.

Instructions:

Toss the 'Food Chips' into the matching Food container.



4 in the Breads and Cereals

4 in the Fruits and Vegetables

3 in the Milk Container

2 in the Meat and Other Protein.

Game III. Meals from the Cards:

Cards offer many possibilities for programmed games to teach nutrition. The problem in designing games and cards - what and how much information to include. (Pictures of food? Size of serving? Calories? Nutrient content?) The temptation is to include everything. This introduces too many different concepts, the result is a confusion of ideas with "cost of ease of playing." Index cards cut to size were used for the following type Deck of Food Cards.

Food Suits:

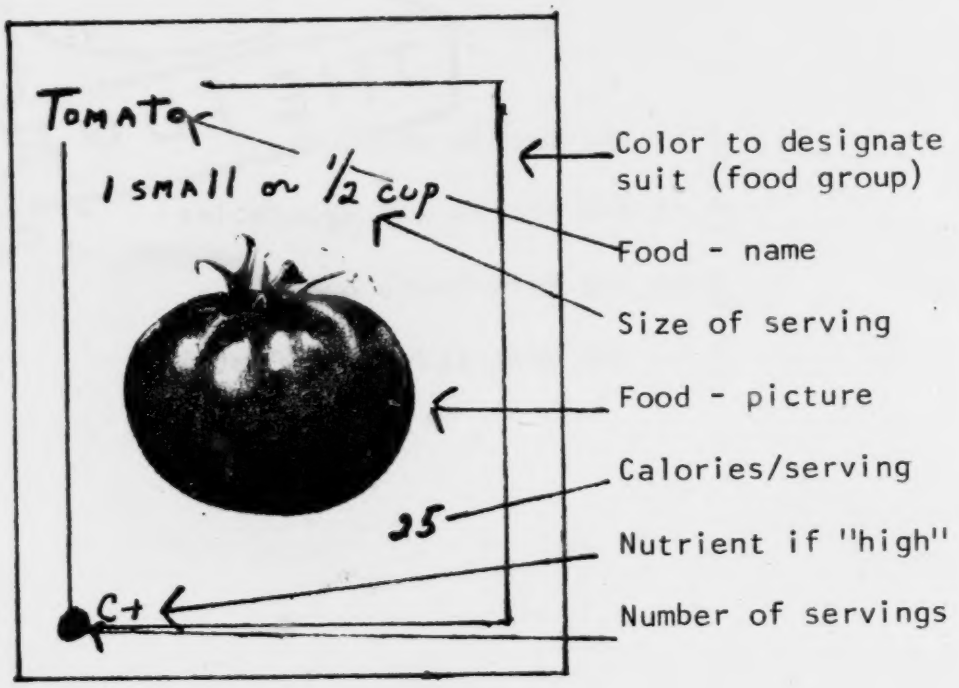
MEAT AND OTHER PROTEIN
(11 cards - red)

FRUITS AND VEGETABLES
(22 cards - green)

BREADS AND CEREALS
(11 cards - orange)

MILK AND DAIRY FOODS
(11 cards - yellow)

COMBINATION FOODS
(7 multi-color cards)



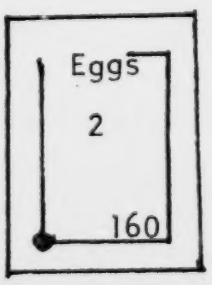
Game object: Plan the day's meals, using the foods on the cards in the correct proportions - 4 servings breads and cereals; 4 fruits and vegetables; 3 milk; and 2 meat or other protein.

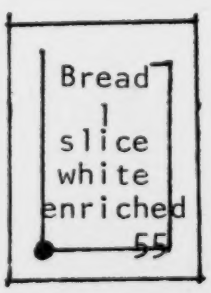
Instructions: Deal each player 5 cards. Place remaining cards face down in center to form a "draw pile." Turn top card FACE up next to draw pile. This card determines play. Each player plans the day's meals using FACE card and cards in his hand. Draw a card from center, in turn, until one (or all) player(s) complete the day's menu. "Best" or first menu completed wins.

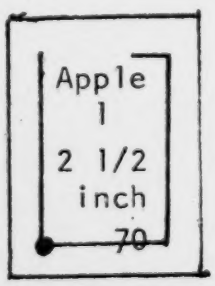
Face card

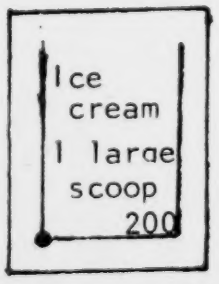
for example

Hand









Procedure of Testing

The three games were introduced to 21 4-H members participating in an "Action Program for Nutrition" at the National 4-H Conference. The 6 boys and 15 girls were all junior leaders in some phase of the 4-H program. Each had expressed an interest and concern in the nutritional problems prevelant in our society. During the first two days' sessions, the junior leaders reviewed and discussed the importance of good nutrition, what constitutes a good diet, and the prevalence and effect of malnutrition. The third day they were to define ways of using the information in the 4-H program.

Instructional Set Established:

A nutrition game developed for older boys and girls by Dr. Frances Hall and Committee, and used at the 1969 National Youth Power Congress started the day. This game patterned after the TV show, "To Tell the Truth," was based on material covered during the first two days' activities. Reaction to the game was excellent. It was an opportunity for self-evaluation by the members; a good test of their nutritional knowledge. Comments indicated it would be a good activity for teen 4-H groups - an easy way to learn about nutrition, but definitely for older members. Playing this game established a positive attitude toward games, an ideal "set" for introducing the idea of test-playing simple games to teach nutrition to younger 4-H members.

Playing the Game:

Junior leaders were divided randomly into three groups. Each group was given a different game with directions for playing and instructions to:

1. Take about 10 minutes to play the game. Select a name for it.

2. Adapt the rules, if necessary, to fit age level you think should play the game.

3. Evaluate the game - would it be a useful tool to teach the Four Food Concepts of nutrition to younger boys and girls.

4. Suggest possibilities for other games using the same type objects as used in the game they played. Or, how can their game be varied to create a new or different game.

None of the games as designed included snacks as a specific part of its nutrition teaching. And, since snacks are known to play such an important part in the diets of children and teenagers, it was decided to introduce the idea of nutritious snacks along with the games. This was done as the junior leaders played the games.

After the groups had been playing their games for six or seven minutes, they were asked how they were doing - ready for a break? At the same time, they were each given a small (1/2 ounce) box of raisins, with the added comment, "Here's a nutritious snack to pep you up." Presenting the raisins in this manner combined immediate reinforcement with the stimulus to connect snacks with nutrition.

It was also intended to serve as an illustration for the junior leaders of a technique they might use to reinforce their younger members' activities and learning.

Evaluation and Comments

Game I:

* Name selected: Mr. Nutrient. Alternate names--Mr. Protein or Body Blocks

* Rules: No need to change the rules. Have each player use one dice.

* Age group: Beginning members would like it! Would also be good to use with younger boys and girls in community projects like Head Start. High school kids might not go for it.

* Other Possibilities or Adaptations: Toy pieces really make the game but if they are not available, the same idea could be used with pencil and paper and imagination to draw a figure as the dice are rolled. Or if there are no dice,cards could be used - draw a card - the suit to determine parts to use.

* General Reaction: Was fun! Any number of members could play at the same time so would be good for project meetings. Relating parts to nutrients rather than foods alone was good added to learning.

Game II:

* Name selected: How the Chips Fall.

* Rules: Need more (better) rules defined. Establish line to "pitch chips" from - behind a chair or roped off area so no one oversteps line. Give each player 13 chips. Each player in turn to throw all his chips before next player has turn.

* Age Group: Nine to twelve-year-olds would have fun playing.

* Other Possibilities or Adaptations: Increase learning by having the members call out the name of a food belonging to the food group, as he gets his chip into that container. Should be a new or different food each time. As members become familiar with foods (or for older kids) have the foods named that could go together to make a meal or a menu for the entire day. Use same idea with Ring Toss game or Dart Board - paste food pictures on boards to relate to food groups. Might also use food pictures from magazines laid on floor (carpet - chips bounce on hard surface) - toss chips onto pictures.

* General Reaction: Harder than it looks to get chips in container.

Game III.

* Name Selected: Plan A Meal (for younger kids) - Plan A Day (for teens)

* Age Group: Too complicated for little kids as is but should be able to adapt to any age level.

* Rules: Game has possibilities but cards for entire day are to hard to keep track of. Have younger members end game with food for one meal - start another game for next meal. Cards should be in direct mathematical proportion - related to the number of players and cards needed.

  For example: For maximum of 6 players, have at least 78 cards of the basic food groups: (4-4-3-2)

  6 x 4 servings Breads & Cereals = 24 cards
  6 x 4 servings Fruits & Vegetables = 24 cards
  6 x 3 servings Milk or Milk Products = 18 cards
  6 x 2 servings Meat or Other Proteins = 12 cards

  Any mixtures or combinations (stews or sandwiches) should be extra and no more than one or two cards, so bonus cards are real premium cards.

* Other Possibilities or Adaptations: If cards are worked out in a systematic manner, should be able to play many different games with same cards. For older members - using calories and/or nutrients, play Weight Watchers Dilemma. Little kids might do better with Slap or Old Maid rules. Might also have a solitaire game. Good idea for learning.

Observations and Results

There were many problems and limitations in the experimental structure used to test the three nutrition games. In the first place, the games were enough different that it would be impossible to consider them as one coordinated experiment. Each group reacted to their own game situation in an entirely different way. There was no provision made to determine whether their reactions were a result of the game, the method of presenting the game, or the group itself.

Group I was the most interested group. They showed more enthusiasm, clearly enjoyed playing the game. Everyone was able to finish a figure in the time allowed for playing the game. The novelty effect of the toy parts appeared to be a definite factor in their reactions. Deliberate detail in giving instructions - relating nutrients to food groups and to a function it performs in the body - also seemed to produce results. (Similarity contiguity). It would be interesting to use this game in a controlled experiment using the relationship of toy pieces to food groups as the only variable and see what the effect would be.

In Group II, a minimum of instructions were given. They experienced some frustration with the mechanics of the game, were slow to begin--mainly because of lack of information to get them started. They wanted rules, insisting on definite guidelines for where to stand, who pitches when, and how many pitches each should get per turn. They expected the pitching to be easy but no one was able to get all his 4-4-3-2 chips into the containers. It may have helped to have let them all pitch chips at the large box before starting the actual game. This would have helped form a better "set." The game didn't hold their interest to the same degree as Group I; but after they had established rules, they moved quickly into a discussion of variations of the game that would provide greater learning of nutrition.

Group III was frustrated. But they appeared to be challenged to a greater extent than the other two groups. The cards suggested too many possibilities to them without any clear solutions. They never completely overcame the problem of game mechanics. But in trying to arrive at solutions, they discussed nutritional concepts and how to fit them into a card game format that younger boys and girls could learn from. They came up with more concrete suggestions for refinement of their game than the other groups.

Obviously the (too) many variables introduced to the junior leaders in the playing of these three games were not tested. It would have been better from an experimental standpoint to have used only one of the games and had each group play it. The method of playing or the way the instructions were given could have been varied to test effectiveness. However, if the exercise is considered as an exploratory experiment, it serves a useful purpose. The three games and all the problems encountered indicate possible direction for future study.

III. CONCLUSIONS

The results of this exploratory experiment with "nutrition games to teach," combined with readings of programmed instruction indicate games could be a good supplement to the 4-H Food - Nutrition Projects at all age levels. They suggest hypotheses for further testing; e.g., "Programmed nutritional games played by beginning 4-H members will increase the nutritional knowledge of these members."

Games could serve not only as gimmicks to motivate learning but, if correctly programmed, using suggested guidelines to apply learning principles would be teaching devices by themselves. The three games developed for this study show possibilities for being self-instructional programs but were not adequately tested to be considered as such at this time. They did, however, arouse interest and motivate the junior leaders who played the game to more discussion of nutrition.

The prime goal of providing a method for teaching the four foods concept of nutrition to nine and ten-year-olds was not tested. To be properly evaluated in this respect, the game should be: played in a controlled setting, by members of the appropriate age level, at the 4-H Food - Nutrition project meeting--preferably with the volunteer or junior leader directing.

The members selected to "test-play" the game should be pre-tested to determine their pre-game nutritional knowledge. This would serve two purposes: (1) a guidelines to measure the extent of nutrition facts learned as a result of playing the game, and (2) a means of testing the game's self-instructional capacity.

More precise and specific detailing of the learning expected from each step of the experimental games should be spelled out before proceeding with more testing. This would facilitate defining rules to avoid confusion of players. It should also help to create a better understanding of the relationship between the activities to be carried out by the members (learners) and the subject-matter content to be learned. With this in mind, the game could be used as a training tool with leaders and junior leaders.

If relationship between learner and what is to be learned is adequately perceived by both leaders and members, then the nutrition part of the Food - Nutrition Project should become an active doing part of every aspect of the project--the buying, the management, the preparation and the science.

The interest of the junior leaders who played the games appeared to justify further study and evaluation of these or similar nutritional games. Their reactions also indicated a capability and willingness to explore new ideas and to find ways of implementing them. I think junior leaders in the county 4-H programs would welcome the opportunity to use games or other self-instructional devices on an experimental basis with their own beginning project groups.

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